Claims:

1.   A method for identifying an analyte with explosive characteristics in a differential mobility spectrometer (DMS), comprising:

supplying at least one analyte with explosive characteristics to a flow channel of the DMS;

selecting at least one dopant having an electron affinity;

delivering an ionized flow of the at least one analyte and the at least one dopant to the flow channel;

applying an asymmetric RF voltage and a compensation voltage to filter electrodes located on or in the flow channel;

detecting at least one signal corresponding to the ionized flow passing between the filter electrodes; and

identifying said analyte based on the at least one detected signal.

2.   The method of claim 1, and further comprising the step of selecting an analyte and adjusting the operating pressure in the flow channel according to the selection.

3.   The method of claim 1, wherein the electron affinity of the at least one dopant is smaller than an electron affinity of the analyte to be identified.

4.   The method of claim 1, wherein the at least one analyte passes through a gas chromatograph (GC) before being supplied to the flow channel.

5.   The method of claim 1, wherein the dopant is selected from the group consisting of methylene bromide (CH_2Br_2), methylene chloride (CH_2Cl_2), chloroform ($CHCl_3$), water (H_2O), methanol (CH_3OH), and isopropanol.

6.   The method of claim 1, wherein the analyte is selected from the group consisting

of HMX, Tetryl, PETN, RDX, NG, TNT, EGDN, DNT, o-MNT, p-MNT, DMNB, TATP, HMTD and AN.

7.   A method for detecting an explosive-related analyte in a differential mobility spectrometer (DMS), comprising:

supplying a mixture comprising the explosive-related analyte and a dopant to the DMS;

ionizing at least one of the explosive-related analyte and the dopant to produce ionized species;

producing in a filter region of the DMS at least two different electric field conditions by applying an asymmetric RF AC field and a compensating DC field;

detecting a signal characteristic of a response of the ionized species to a combination of the asymmetric RF AC and the compensating DC field in the filter region; and

determining the explosive-related analyte based on the detected signal.

8.   The method of claim 7, wherein the at least one dopant and the analyte each have respective electron affinities, and wherein the analyte is detected based on a relationship between the electron affinity of the at least one dopant and the electron affinity of the analyte.

9.   The method of claim 8, wherein the electron affinity of the at least one dopant is smaller than the electron affinity of the analyte to be detected.

10.   The method of claim 7, and further comprising adjusting a pressure in the DMS.

11.   The method of claim 7, wherein the at least one analyte passes through a gas chromatograph (GC) before being supplied to the DMS.

12.   The method of claim 7, wherein the dopant is selected from the group consisting

of methylene bromide (CH_2Br_2), methylene chloride (CH_2Cl_2), chloroform ($CHCl_3$), water (H_2O), methanol (CH_3OH), and isopropanol.

13.   The method of claim 7, wherein the analyte is selected from the group consisting of HMX, Tetryl, PETN, RDX, NG, TNT, EGDN, DNT, o-MNT, p-MNT, DMNB, TATP, HMTD and AN.

14.   A method for detecting a taggant added to an explosive material using a differential mobility spectrometer (DMS), the steps comprising:

delivering an ionized flow of the taggant to a flow channel of a DMS;

applying an asymmetric RF voltage and a compensation voltage to filter electrodes disposed on or in the flow channel; and

detecting said taggant based on at least one detected signal for a combination of the asymmetric RF voltage and the compensation voltage.

15.   The method of claim 14, wherein the taggant is a material selected from the group consisting of DMNB, o-MNT (ortho-mononitrotoluene) and p-MNT (para-mononitrotoluene).

16.   The method of claim 14, wherein the DMS comprises a gas chromatograph (GC) and the taggant passes through the GC.

17.   The method of claim 14, wherein the taggant is o-MNT or p-MNT, and further including adding a dopant before delivering the ionized flow of the taggant to the flow channel.

18.   Apparatus for fast characterization of an explosives-related chemical sample, comprising:

an input part, an ion filter part for filtering ions, an output part, and a flow path connecting said parts,

said parts being supported by a support structure, said ion filter part including at least a pair of filter electrodes, said filter electrodes being formed on said support structure,

said flow path defining a flow axis extending between said input part and said output part through said ion filter part,

said support structure including an electrode support in said ion filter part adjacent to said filter electrodes for support of said filter electrodes in said ion filter part, said filter electrodes being separated and forming an analytical gap in said ion filter part, said flow path extending through said analytical gap, said electrode support including a spacer part for separating said filter electrodes, and

said analytical gap and the sides of said flow path in said ion filter part being defined by cooperation of said filter electrodes, filter electrode support, and said spacer part, with said filter electrodes providing a compensated asymmetric filter field within said analytical gap for differential ion mobility analysis of said species.

19. Apparatus of claim 18 wherein said input part is for receiving a sample including at least one analyte associated with a chemical explosive compound, said input part for delivering a flow of ions to said flow path, said flow of ions including at least one ion species associated with said analyte, said flow of ions flowing along said flow path to said ion filter part, said ion filter part filtering said flow of ions.

20. Apparatus of claim 19 wherein said ion filter part provides a compensated asymmetric field across said flow path transverse to said flow axis for selection of said at least one ion species out of said flow of ions, said selection being at least in part based on high and low field mobility characteristics of said selected at least one ion species in said compensated asymmetric field.

21. Apparatus of claim 20 further including a detection part for detection of said

selected ion species for enabling identification of said detected ion species and for identification of said chemical explosive compound.

22.   Apparatus of claim 21 wherein said support structure is formed by substrates and said filter electrodes are formed on said substrates.

23.   Apparatus of claim 18 further comprising a chromatograph for supply of eluent including a chromatographic peak, wherein said identification of said chemical explosive compound includes identification of said analyte based on retention time associated with said peak in said chromatograph.

24.   Apparatus of claim 18 wherein said output part includes a detector for detection and identification of said at least one ion species, wherein said detection data includes (a) detection of said at least one ion species, (b) said retention time, and (c) conditions of said compensated asymmetric field.

25.   Apparatus of claim 24 wherein said detection data is compared to known data to make said identification of said at least one ion species .

26.   Apparatus of claim 18 further including a detection part for detection of said selected ion species, said detection part including ion detectors for simultaneous detection of positive and negative ion species passed by said ion filter.

27.   Apparatus of claim 18 further including a housing, wherein said filter electrodes have inner faces facing each other across said flow path for forming said filter field and outer faces mounted on said housing.

28.   A method for fast analysis of explosives-related compounds, including the steps of :

providing a high field asymmetric ion mobility filter system with an internal flow path, enabling attachment of the output of a chromatograph system to said flow path at the input part of said high field asymmetric ion mobility filter system, said system further

including, an ion filter part for filtering ions, and an output part, said flow path connecting said parts,

separating at least one analyte chromatographically from a chemical mixture and eluting said separated analyte into said flow path, said analyte forming a chromatographic peak associated with an explosives-related compound, said peak having a peak duration of some time period,

providing a flow of ions to said ion filter part in said flow path within said time period, including the step of ionizing at least a portion of said separated at least one analyte and forming at least one ion species, further including flowing said at least one ion species into said flow of ions within said time period,

providing said compensated asymmetric filter field transverse to said flow path in said ion filter part within said time period,

filtering said flow of ions within said time period and selecting said at least one ion species out of said flow of ions, said selection being made according to aspects of ion mobility characteristics of said at least one ion species in said transverse field within said time period, and

passing said selected at least one ion species to said output part within said time period for characterization of said at least one analyte according to mobility characteristics of said selected at least one ion species in said transverse field within said time period.

29.   The method of claim 28 further including the steps of

supporting said parts with a support structure, said ion filter part including at least a pair of filter electrodes, said filter electrodes being on said support structure,

providing said support structure with an electrode support in said ion filter part adjacent to said filter electrodes for support of said filter electrodes in said ion filter part,

said electrode support including a spacer part for separating said electrodes, said filter electrodes being separated and forming an analytical gap in said ion filter part, said flow path extending through said analytical gap, and

defining said analytical gap as well as the sides of said flow path in said ion filter part by cooperation of said support structure, said filter electrode support, and said spacer part, wherein said filter electrodes provide a compensated asymmetric filter field within said analytical gap.

30.   Method of claims 1, 7, 14, and 29 wherein said support structure includes at least one substrate and further including the step of forming a housing for containing said ion filter and said internal flow path, further including the step of providing said filter with filter electrodes having inner faces facing each other across said flow path for forming said field, said facing electrodes having outer faces associated with said housing.

31.   Method of claims 1, 7, 14, and 30 further comprising steps of applying a high asymmetric RF field in said filter and detecting positive and negative ions simultaneously passing through said high RF field for identification of at least one ion species passed by said filter.

32.   Method of claim 28 further comprising the step of collecting detection data and obtaining retention time, compensation voltage and detection intensity, and relating this data to a store of data to identify said detected species